

FIG. 1

SOLDER BALL THERMAL CYCLING FATIGUE TEST DATA

ROW	SAMPLE SIZE	CHIP SIZE (mm x mm)	ORGANIC SUBSTRATE PAD DIAMETER, D2 (mm)	CHIP PAD DIAMETER, D1 (mm)	D1/D2	S1/S2	SOLDER BALL HEIGHT (μ m)	DISTANCE (D _{EDGE}) FROM SOLDER BALL CENTERLINE TO CHIP EDGE (μ m)	NO. OF CYCLES TO 50% FAILS	FIRST CYCLE TO FAIL
1	47	8.7 x 8.7	160	140	0.88	0.77	110	230	13260	2500
2	30	8.7 x 8.7	155	140	0.90	0.81	110	100	8430	2500
3	19	8.7 x 8.7	160	140	0.88	0.77	110	100	7963	2500
4	75	7.68 x 7.68	160	100	0.63	0.40	100	100	3250	600

FIG. 2

AVERAGE SHEAR STRAIN VERSUS DISTANCE (D_C) BETWEEN
CENTER OF CHIP AND CENTERLINE OF C4 SOLDER BALL

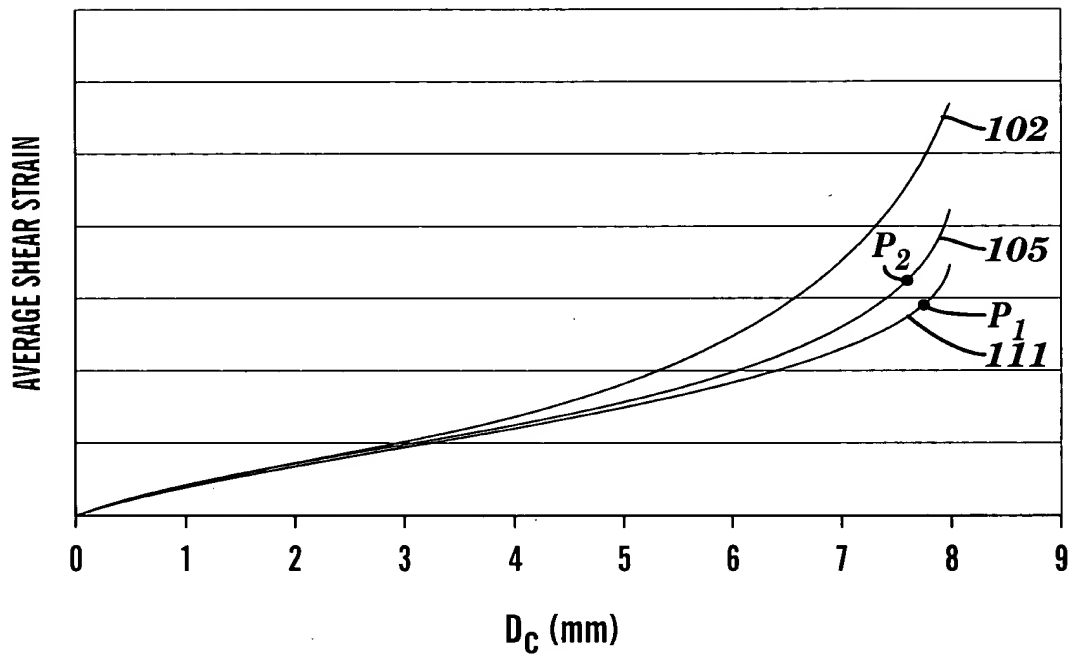


FIG. 3

AVERAGE AXIAL STRAIN VERSUS DISTANCE (D_C) BETWEEN
CENTER OF CHIP AND CENTERLINE OF C4 SOLDER BALL

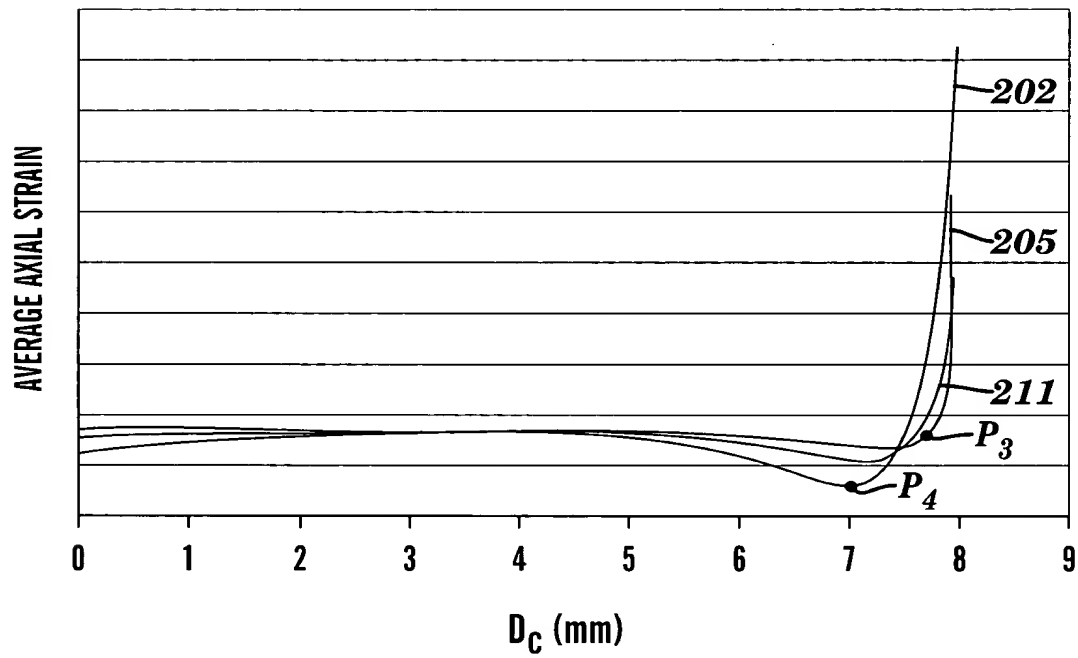


FIG. 4